

Remarks

Applicants have withdrawn non-elected claims 1-23 and have added new claims 35-43. Therefore, claims 24-43 will be pending after entry of this Amendment. The following discussion addresses the Examiner's comments and rejections in the order in which they were raised in the Office Action mailed July 14, 2003.

The 35 U.S.C. § 112 Rejections

The Examiner has rejected claims 24-34 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 24 stands rejected for allegedly being confusing. The examiner contends that it is unclear how a biofilm is applied and that the definition of a biofilm consisting of one bacterium appears incorrect, particularly with respect to dependent claim 32, wherein the biofilm (bacterium) is between about 10 μm and about 20 μm thick. In the interest of expediting prosecution and not for purposes of patentability, claim 24 has been amended to replace the term "applying" with the term "forming," which is supported in the specification, for example, at page 9, lines 6 and 15. Likewise, in the interest of expediting prosecution and not for purposes of patentability, claim 24 and dependent claims 28-30 have been amended to replace the term "bacterium" with the term "bacteria." Accordingly, Applicants request withdrawal of this rejection.

Claim 27 stands rejected due to an alleged vagueness and indefiniteness of the phrase "mild steel 1010." The examiner contends that the phrase does not appear to be a term of art and it is unclear as to what the phrase is intended to encompass. The phrase is clear to one of skill in the art and is defined in the specification as a particular grade of steel meeting the industry standard for that designation, for example, at page 8, lines 27 and 28. Accordingly, the phrase "mild steel 1010" is clear, and Applicants request withdrawal of this rejection.

Claim 34 stands rejected due to an alleged vagueness and indefiniteness of the phrase "Luria-Bertani medium." The examiner contends that the phrase does not appear to be a term of art and it is unclear as to what the phrase is intended to encompass. The phrase is

supported in the specification, for example, at page 12, lines 10-13. Accordingly, the phrase "Luria-Bertani medium" is clear, and Applicants request withdrawal of this rejection.

Claims 28-30 stand rejected due to an alleged vagueness and indefiniteness of the phrase "a bacterium." The examiner contends that it is unclear whether the bacterium recited is the same as or in addition to the biofilm bacterium. Claim 28 has been amended to recite, "...wherein said biofilm comprises aerobic bacteria"; claim 29 has been amended to recite, "...wherein said biofilm comprises *E. Coli*"; and claim 30 has been amended to recite, "...wherein said bacteria..." to further clarify the claims. Accordingly, Applicants request withdrawal of this rejection.

Claim 31 stands rejected for allegedly being confusing. The examiner contends that it is unclear whether the polyanionic chemical composition applied is the polyanionic chemical composition secreted by the bacterium. Claim 31 has been amended to recite, "...wherein said polyanion is polyphosphate" to further clarify the claim. Accordingly, Applicants request withdrawal of this rejection.

The 35 U.S.C. § 103 Rejections

The Examiner has rejected claims 24-34 under 35 U.S.C. § 103(a) as being unpatentable over Jayaraman *et al.*, Appl. Microbio. & Biotech. 47:62-68 (1997) ("Jayaraman") in view of Sekine *et al.*, J. Electrochem. Soc. 139(11):3167-3173 (1992) ("Sekine") and Hardoyo *et al.*, Appl. and Environ. Microbio. 60(10):3485-3490 (1994) ("Hardoyo"). Applicants respectfully traverse the rejection.

When rejecting claims under 35 U.S.C. § 103, the examiner bears the burden of establishing a *prima facie* case of obviousness. Three criteria are required to establish a *prima facie* case of obviousness. First, the prior art reference, or references when combined, must teach or suggest each and every limitation of the claimed invention. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the teachings of the references in the manner suggested by the examiner. Finally, the skilled artisan, in light of the teachings of the prior art, must have a reasonable expectation that the modification or combination suggested by the examiner would be successful. Both the teaching or suggestion to make the claimed invention and the reasonable expectation of success must be found in the

prior art, not in the Applicants' disclosure. If any one of these criteria is not met, *prima facie* obviousness has not been established.

Applicants submit that the combination of Jayaraman, Sekine and Hardoyo are insufficient to establish a *prima facie* case of obviousness against claims 24-34. Amended independent claim 24 recites a method for reducing corrosion comprising providing a metal with an exterior surface and forming on the exterior surface a protective biofilm that reduces corrosion of the exterior surface, wherein the protective biofilm comprises bacteria that secrete a polyanion.

Jayaraman teaches that the corrosion of carbon steel 1018 in a liquid medium can be inhibited through the use of a protective biofilm of either *P. fragi* or *E. Coli* DH5 α . Jayaraman does not teach the use of a protective biofilm comprising bacteria that secrete a polyanion as acknowledged by the Examiner. Further, amended claim 25 recites that the metal is selected from the group consisting of aluminum, an aluminum alloy, copper, a copper alloy, titanium, a titanium alloy, nickel and a nickel alloy; amended claim 27 recites that the metal comprises mild steel-1010; whereas Jayaraman teaches only inhibition of the corrosion of carbon steel 1018. Amended claim 30 recites that the bacteria that secrete a polyanion have been genetically engineered, whereas Jayaraman does not teach bacteria that are genetically engineered to secrete a polyanion. Amended claim 31 recites that the polyanion is polyphosphate, whereas Jayaraman does not teach bacteria that secrete polyphosphate. Amended claim 32 recites that the biofilm is between about 10 μ m and about 20 μ m thick, whereas Jayaraman does not teach biofilm thickness. Accordingly, Jayaraman does not teach each and every limitation of claim 24 and its dependent claims 25-34.

The deficiencies in Jayaraman are not cured by Sekine or Hardoyo, either alone or in combination. Sekine teaches the use of polymaleic acid derivative (PMAD), polyacrylic acid derivative (PAAD) and polyacrylic acid (PAA) as anionic polymers for inhibiting corrosion of mild steel JIS SS400 (UNS K02600) in cooling water systems containing either low or high concentrations of ions such as calcium and chloride. *See* Sekine at 3169-3173. Sekine does not teach bacteria, much less bacteria that form biofilms on metals and secrete polyanions. Sekine merely teaches three specific polyanions, namely PMAD, PAAD and PAA, none of which are secreted by bacteria, and each of which were found effective in reducing corrosion of mild steel only if their number average molecular weight and their

carboxylic acid content are within specific parameters, and they are not inhibited by competing adsorbents. *See Id.* at 3173.

Sekine not only fails to teach each and every limitation of the pending claims, either alone, or in combination with Jayaraman, but also, Sekine provides no motivation or suggestion to combine its teaching of polyanions with the biofilms of Jayaraman. The Examiner has provided no finding as to the principle or specific understanding within the knowledge of one skilled in the art that would have motivated one skilled in the art to believe that biofilms are capable of producing polyanions, much less the polyanions taught by Sekine. *See In re Kotzab*, 217 F.3d 1365, 1371 (Fed. Cir. 2000). Furthermore, the Examiner appears to be using the teaching of the specification as a roadmap to combine references, and the Federal Circuit has held that it is improper to use the teaching of the specification against the applicant in determining whether a person of ordinary skill would have been led to a combination of references. *See In re Lee*, 277 F.3d 1338, 1343 (Fed. Cir. 2002).¹

Hardoyo not only fails to teach each and every limitation of the claims, either alone, or in combination with Jayaraman and Sekine, but also, Hardoyo provides no motivation or suggestion to combine its teaching of polyanions with the biofilms of Jayaraman. Hardoyo does not teach the use of bacteria to secrete polyphosphates or any other polyanion, much less such bacteria that will form a protective biofilm on the exterior surface of a metal. Rather, Hardoyo teaches the use of a recombinant strain of *E. Coli* bacteria that have been genetically engineered to accumulate polyphosphates for use in the removal of inorganic phosphates (P_i) from wastewater. *See* Hardoyo at 3488-3489. As such, Hardoyo does not teach the release of polyphosphates. On the contrary, Hardoyo teaches that polyphosphate release is undesirable and only occurs in connection with the use of *E. Coli* in the biological removal of phosphorous from wastewater due to accumulation of abnormally high levels of P_i in the *E. Coli*. In fact, Hardoyo also teaches that the release of polyphosphate by bacteria has not been previously reported anywhere in the literature. *See Id.* More specifically, Hardoyo teaches the adverse effects of polyphosphate release from *E. Coli*. As such, Hardoyo provides no

¹ *Lee* cites to *W.L. Gore v. Garlock, Inc.*, 721 F.2d 1540, 1553 (Fed. Cir. 1983)(stating it is improper to “[use] that which the inventor taught against its teacher”); *See also, In re Dow Chem. Co.*, 837 F.2d 469, 473 (Fed. Cir. 1988)(stating “[t]here must be a reason or suggestion in the art for selecting the procedure used, other than the knowledge learned from the applicant’s disclosure”); and *Grain Processing Corp. v. American Maize-Prods. Co.*, 840 F.2d 902, 907 (Fed. Cir. 1988)(stating that “[c]are must be taken to avoid hindsight reconstruction by using the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claims in suit.”)

motivation or suggestion to combine its teachings with that of Jayaraman or Sekine by specifically teaching that *E. Coli* can be genetically engineered to retain high levels of polyphosphate. Thus, Hardoyo teaches away from the release of polyphosphate. *See Id.* at 3488-3489.

Since the combination of Jayaraman, Sekine and Hardoyo is insufficient to establish a *prima facie* case of obviousness against claim 24, the rejection of dependent claims 25-34 is now moot. Accordingly, Applicants respectfully request withdrawal of this rejection.

Conclusion

In view of the above considerations, Applicants respectfully request a timely Notice of Allowance in this application. The Examiner is invited to call the undersigned attorney if a telephone call could help resolve any remaining items.

Applicants have authorized payment for the additional claims submitted in this Response. However, if it is determined that any additional fee is due, please charge the required fee to Pennie & Edmonds LLP Deposit Account No. 16-1150. A copy of this sheet is enclosed for this purpose.

Respectfully submitted,

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